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SOME COMMON BIRDS USEFUL TO THE FARMER.

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INTRODUCTION.

Whether a bird is beneficial or injurious depends almost entirely upon what it eats. In the case of species which are very abundant, or which feed to some extent on the crops of the farmer, the question of their average diet becomes one of supreme importance, and only by stomach examination can it be satisfactorily solved. Field observations are at best but fragmentary and inconclusive and lead to no final results. Birds are often accused of eating this or that product of cultivation, when an examination of the stomachs shows the accusation to be unfounded. Accordingly, the Biological Survey has conducted for some years past a systematic investigation of the food of those species which are most common about the farm and garden.

Within certain limits birds eat the kind of food that is most accessible, especially when their natural food is scarce or wanting. Thus they sometimes injure the crops of the farmer who has unintentionally destroyed their natural food in his improvement of swamp or pasture. Most of the damage done by birds and complained of by farmers and fruit growers arises from this very cause. The berry-bearing shrubs and seed-bearing weeds have been cleared away, and the birds have no recourse but to attack the cultivated grain or fruit which have replaced their natural food supply. The great majority of land birds subsist upon insects during the period of nesting and moulting, and also feed their young upon them during the first few weeks. Many species live almost entirely upon insects, taking vegetable food only when other subsistence fails. It is thus evident that in the course of a year birds destroy an incalculable number of insects, and it is difficult to overestimate the value of their services in restraining the great tide of insect life.

In winter, in the northern part of the country, insects become scarce or entirely disappear. Many species of birds, however, remain during the cold

Note.—The habitat, food habits, and economic relation to agriculture of more than 50 birds common to farming sections are discussed in this bulletin. It supersedes Farmers' Bulletin 54.

season and are able to maintain life by eating vegetable food, as the seeds of weeds. Here again is another useful function of birds in destroying these weed seeds and thereby lessening the growth of the next year.

In the following pages are discussed the food habits of more than 50 birds belonging to 12 families. Many are eastern forms which are represented in the West by slightly different species or subspecies, but unless the food habits differ they are not separately described. In some cases specific percentages of food are given, but for the most part the statements are made without direct reference to the data on which they are based.[1]

The parts of this bulletin relating to the crow and blue jay were contributed by E. R. Kalmbach, and the discussion of the nighthawk is by W. L. McAtee, both of the Bureau of Biological Survey.

THE BLUEBIRDS.

The eastern bluebird[2] (fig. 1), one of the most familiar and welcome of our feathered visitors, is a common inhabitant of all the States east of the Rocky Mountains from the Gulf of Mexico to southern Canada. In the Mississippi Valley it winters as far north as southern Illinois, and in the East as far as Pennsylvania. It is one of the earliest northern migrants, and everywhere is hailed as a harbinger of spring. Very domestic in habits, it frequents orchards and gardens, and builds its nests in cavities of trees, crannies in farm buildings, or boxes provided for its use.

FIG. 1.—Bluebird. Length, about 6½ inches.

The bluebird has not been accused, so far as known, of stealing fruit or of preying upon crops. An examination of 855 stomachs showed that 68 per cent of the food consists of insects and their allies, while the other 32 per cent is made up of various vegetable substances, found mostly in stomachs taken in winter. Beetles constitute 21 per cent of the whole food, grasshoppers 22, caterpillars 10, and various other insects 9, while a number of spiders and myriapods, about 6 per cent, comprise the remainder of the animal diet. All these are more or less harmful, except a few predacious beetles, which amount to 9 per cent. In view of the large consumption of grasshoppers and caterpillars we may at least condone this offense, if such it may be called. The destruction of grasshoppers is very noticeable in August and September, when these insects make up about 53 per cent of the diet.

It is evident that in the selection of its food the bluebird is governed more by abundance than by choice. Predacious beetles are eaten in spring, as they are among the first insects to appear; but in early summer caterpillars form an important part of the diet, and these are later replaced by grasshoppers. Beetles are eaten at all times, except when grasshoppers are more easily obtained.

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[1] Farmers' Bulletins describing the food habits of wild birds and groups of birds, or presenting methods of attracting them about our homes have been issued as follows:

54. Some Common Birds in their Relation to Agriculture, by F. E. L. Beal, 1897. The present bulletin is largely a revision of this bulletin and supersedes it.

383. How to Destroy English Sparrows, by Ned Dearborn, 1910. This bulletin has been superseded by Farmers' Bulletin 493.

456. Our Grosbeaks and Their Relation to Agriculture, by W. L. McAtee, 1911.

493. The English Sparrow as a Pest, by Ned Dearborn, 1912.

497. Some Common Game, Aquatic, and Rapacious Birds in Relation to Man, by W. L. McAtee and F. E. L. Beal, 1912.

506. Food of Some Well-known Birds of Forest, Farm, and Garden, by F. E. L. Beal and W. L. McAtee, 1912.

513. Fifty Common Birds of Farm and Orchard, prepared under the direction of Henry W. Henshaw, 1913. This bulletin was issued with illustrations in color, and the demand for it was so enormous that it is no longer available for free distribution. Copies may be had for 15 cents (postage stamps not accepted) of the Superintendent of Documents, Government Printing Office.

609. Bird Houses and How to Build Them, by Ned Dearborn, 1914.

621. How to Attract Birds in Northeastern United States, by W. L. McAtee, 1914.

[2] *Sialia sialis.*

So far as its vegetable food is concerned the bluebird is positively harmless. The only trace of any useful product in the stomachs consisted of a few blackberry seeds, and even these probably belonged to wild rather than cultivated varieties. Following is a list of the various seeds which were found: Blackberry, chokeberry, juniperberry, pokeberry, partridgeberry, greenbrier, Virginia creeper, bittersweet, holly, strawberry bush, false spikenard, wild sarsaparilla, sumac (several species), rose haws, sorrel, ragweed, grass, and asparagus. This list shows how little the bluebird depends upon the farm or garden to supply its needs and how easily, by encouraging the growth of some of these plants, many of which are highly ornamental, the bird may be induced to make its home on the premises.

Two species of bluebirds inhabit the Western States—the mountain bluebird[1] and the western bluebird.[2] In their food habits they are even more to be commended than their eastern relative. Their insect food is obtainable at all times of the year, and the general diet varies only in the fall, when some fruit, principally elderberries, is eaten, though an occasional blackberry or grape is also relished. In an examination of 217 stomachs of the western bluebird, animal matter (insects and spiders) was found to the extent of 82 per cent and vegetable matter to the extent of 18 per cent. The bulk of the former consists of bugs, grasshoppers, and caterpillars. Grasshoppers, when they can be obtained, are eaten freely during the whole season. Caterpillars also are a favorite food and are eaten during every month of the year; March is the month of greatest consumption, with 50 per cent, and the average for the year is 20 per cent. Two stomachs taken in January contained 64 and 50 per cent, respectively, of caterpillars. Beetles also are eaten and comprise mostly harmful species.

The vegetable matter consists of weed seeds and small fruits. In December a few grapes are eaten, but elderberries are the favorites whenever they can be found. It is only when these are in their greatest abundance that vegetable exceeds animal food.

FIG. 2.—Robin. Length, about 10 inches.

THE ROBINS.

The robin[3] (fig. 2), in many parts of the country one of the most cherished of our birds, is found throughout the States east of the Great Plains, and is represented farther west and south by slightly different subspecies.[4,5] It breeds far north through Canada, and is found even in Alaska. Although the great bulk of the species leaves the Northern States in winter, a few individuals remain in sheltered swamps, where wild berries furnish abundant food. The robin is an omnivorous feeder and its food habits have sometimes caused apprehension to the fruit grower, for it is fond of cherries and other small fruits, particularly the earlier varieties. For this reason many complaints have been lodged against the bird, and some persons have even gone so far as to condemn it. It is, however, far too valuable to be exterminated, and choice fruit can be readily protected from its depredations.

Examinations of 1,236 stomachs show that 42 per cent of its food is animal matter, principally insects, while the remainder is made up largely of small fruits or berries. Over 16 per cent consists of beetles, about one-third of which are useful ground beetles, taken mostly in spring and fall when other insects are scarce. Grasshoppers make up about 5 per cent of the whole food, but in August they comprise 17 per cent. Caterpillars form about 9 per cent, while the rest of the animal food, about 11 per cent, is made up of various insects, with a few spiders, snails, and angleworms. All the grasshoppers, caterpillars, and bugs, with a large portion of the beetles, are injurious, and it is safe to say that noxious insects comprise more than one-third of the robin's food.

Vegetable food forms 58 per cent of the stomach contents, over 42 per cent being wild fruits and only a little more than 8 per cent being possibly cultivated varieties. Cultivated fruit amounting to about 25 per cent was found in

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[1] *Sialia currucoides.*
[2] *Sialia mexicana* subspecies.
[3] *Planesticus migratorius.*
[4] *Planesticus migratorius propinquus.*
[5] *Planesticus migratorius achrusterus.*

the stomachs in June and July, but only a trifle in August. Wild fruit, on the contrary, is eaten every month and constitutes a staple food during half the year. No less than 65 species of fruit were identified in the stomachs; of these, the most important were 4 species of dogwood, 3 of wild cherries, 3 of wild grapes, 4 of greenbrier, 2 of holly, 2 of elder; and cranberries, huckleberries, blueberries, barberries, service berries, hackberries, and persimmons; together with 4 species of sumac and various other seeds not strictly fruit.

The depredations of the robin seem to be confined to the smaller and earlier fruits, few, if any, complaints being made that it eats apples, peaches, pears, grapes, or even late cherries. By the time these are ripe the forests and hedges are teeming with wild fruits which the bird evidently finds more to its taste. The cherry, unfortunately for man, ripens so early that it is almost the only fruit accessible at a time when the bird's appetite has been sharpened by a long-continued diet of insects, earthworms, and dried berries, and it is no wonder that at first the rich juicy morsels are greedily eaten.

While the robin takes some cultivated fruits, it must be remembered that, being a natural enemy of the insect world, it has been working during the whole season to make that crop a possibility, and when the fruit ripens the robin already has a standing account with the farmer for services rendered, with the credits up to this time entirely on his side.

Since the robin takes ten times as much wild as cultivated fruit, it seems unwise to destroy the birds to save so little. Nor is this necessary, for with care both birds and fruit may be preserved. Where much fruit is grown it is no great loss to give up one tree to the birds, and in some cases the crop can be protected by scarecrows. Where wild fruit is not abundant, a few fruit-bearing shrubs and vines judiciously planted will serve for ornament and provide food for the birds. The Russian mulberry is a vigorous grower and a profuse bearer, ripening at the same time as the cherry. So far as observation has gone, most birds seem to prefer its fruit to any other. It is believed that a number of mulberry trees planted around the garden or orchard would fully protect the more valuable fruits.

Much has been written about the delicate discrimination of birds for choice fruit and their selection of only the finest and costliest varieties. This is contrary to observed facts. Birds, unlike human beings, seem to prefer fruit that, like the mulberry, is sweetly insipid, or that, like the chokecherry or holly, has some astringent or bitter quality. The so-called black alder, a species of holly, has bright scarlet berries tasting as bitter as quinine, that ripen late in October and remain on the bushes through November. Though frost grapes, the fruit of the Virginia creeper, and several species of dogwood are abundant at the same time, the birds have been found to eat the berries of the holly to a considerable extent. It is, moreover, a remarkable fact that the wild fruits upon which birds largely feed are those which man neither gathers for his own use nor adopts for cultivation.

THE TITMICE.

Birds of the titmouse family, though insignificant in size, are far from being so in the matter of food habits. What they lack in size of body they more than make up in numbers of individuals. While in the case of some larger birds, as, for instance, the flicker, there is one pair of eyes to look for food for one large stomach, we have in the case of the ten times as numerous titmice an equivalent stomach capacity divided into 10 parts, each furnished with a pair of eyes and other accessories, as wings and feet. As against the one place occupied by the larger bird, 10 are being searched for food at the same time by the smaller species.

The character of the food of titmice gives a peculiar value to their services, for it consists largely of the small insects and their eggs that wholly escape the search of larger birds. Throughout the year most of the species of this group remain on their range, so that they are constantly engaged in their beneficial work, continuing it in winter when the majority of their co-workers have sought a milder clime. It is at this season that the titmice do their greatest good, for when flying and crawling insects are no more to be found, the birds must feed upon such species as they find hibernating in crevices, or upon the eggs of insects laid in similar places. In winter's dearth of moving insects the search for such animal food as may be found is perforce thorough and unremitting.

Within the boundaries of the United States are some 17 species of titmice, with nearly as many races or subspecies, so that there is no portion of the country lacking one or more forms. The western coast region is peculiarly rich in representatives of the family. In the eastern portion of the country the best-known and most widely distributed species is the common black-capped chickadee[1] (fig. 3). This bird, or some of its subspecies, occupies the whole of that part of the United States north of the latitude of Washington and extends into Canada. It is a prolific breeder, usually rearing from six to eight young in a brood.

Examination of 289 stomachs of this chickadee shows that its food consists of 68 per cent animal matter (insects) and 32 per cent vegetable matter. The former is made up of small caterpillars and moths and their eggs. Prominent among the latter are the eggs of the tent-caterpillar moths, both the orchard and forest species. As these are two of our most destructive insects, the good done by the chickadee in devouring their eggs needs no comment. During the winter the chickadee's food is made up of larvæ, chrysalids, and eggs of moths, varied by a few seeds, but as spring brings out hordes of flying, crawling, and jumping insects, the bird varies its diet by taking also some of these. Flies and bugs are the favorites until the weather becomes quite warm, when beetles and small wasps also are enjoyed. Among the bugs may be mentioned the plant lice and their eggs which are eaten in winter. The beetles nearly all belong to the group of snout beetles, more commonly known as weevils. These insects are mostly of small size, and nearly all are known to the farmer or fruit raiser as pests. Seventeen of them were found in one stomach. The plum curculio and the cotton-boll weevil may be taken as fair examples. Grasshoppers do not at any time constitute an important element of the food of the chickadee, as they are too large for so small a bird; moreover they are for the most part terrestrial insects, while the bird is essentially arboreal. Small wasps and ants are eaten to some extent. Spiders constitute an important element of the food and are eaten at all times of the year, the birds locating them when they are hibernating in winter, as well as when they are active in summer. The vegetable food of the chickadee consists largely of small seeds except in summer when they are replaced by pulp of wild fruit. The wax from the seeds of poison ivy is eaten during the winter months, but the seeds themselves are not taken. In this respect the chickadee differs from most other birds which swallow the seeds whole; these, after digesting the wax, pass the seeds through the alimentary canal, and so scatter them broadcast to reproduce the noxious plants.

FIG. 3.—Black-capped chickadee. Length, about 5¼ inches

In the southern part of the country the Carolina chickadee[2] and the tufted tit[3] replace the black-cap, but their food habits are so similar that there is practically no difference in the work done. In the West several other species occur; one of the most interesting is the bush tit[4] which, with several subspecies, occupies the whole Pacific coast region. They are active, social little creatures, and except for a short time during the breeding season are found in flocks, flitting from tree to tree, busily hunting for insects and their eggs. The contents of 66 stomachs of these birds were found to consist mostly of injurious insects to the extent of 83 per cent. Of these the most important was a small hemipterous insect which amounted to more than half of the stomach contents. These insects are of considerable economic importance, as they frequently infest grapevines and other plants to a harmful extent. Several stomachs were almost

[1] *Penthestes atricapillus.*
[2] *Penthestes carolinensis.*
[3] *Baeolophus bicolor.*
[4] *Psaltriparus minimus.*

exclusively filled with these minute creatures, some containing as many as 100 individuals.

Perhaps the most important and interesting insect found was the black olive scale, which occurred in 24 stomachs and amounted to a little more than 18 per cent of the food. In addition a number of the stomachs were more or less filled with another scale, which was not further identified. A number of small snout beetles (weevils) were eaten and some small caterpillars; there were also the remains of a spider.

The vegetable food of the species seemed to consist mostly of seeds, but they were so broken up as to defy recognition. A little fruit pulp and a little mast were also found.

Among the stomachs of the bush tits examined were those of one brood of eight nestlings about 10 days old. The vegetable matter in these stomachs was only three-fourths of 1 per cent and consisted of one seed and some rubbish. The animal matter was made up of beetles, wasps, bugs, caterpillars and pupæ, and spiders. The greatest interest lies in the fact that every one of these stomachs contained pupæ of the codling moth, on an average of over five to each. The oak tree in which these birds were found was in a belt of timber near a neglected orchard which the parent birds used as a foraging ground, and they did their best to remedy the neglect of the owner. As feeding and digestion in the case of nestling birds is almost continuous during the hours of daylight, the above record would be several times repeated during a day's feeding. There were probably not less than a dozen nests of the bush tit along the border of this orchard, and these birds must have exerted a great restrictive influence upon the increase of the codling moth, as well as of other insects in that vicinity.

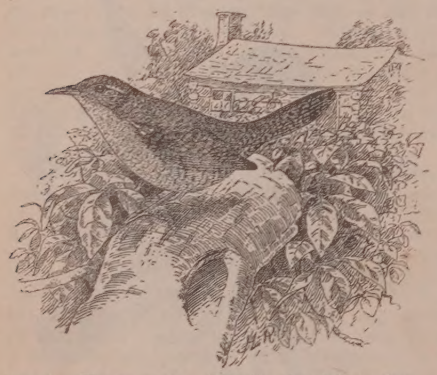

FIG. 4.—House wren. Length, about 4¾ inches.

THE WRENS.

The diminutive house wren[1] (fig. 4) frequents barns and gardens, and particularly old orchards in which the trees are partially decayed. He makes his nest in a hollow where perhaps a woodpecker had a domicile the year before, but he is a pugnacious character, and if he happens to fancy one of the boxes put up for bluebirds, he does not hesitate to take it. He is usually not slow to avail himself of boxes, gourds, tin cans, or empty jars placed for his accommodation.

In food habits the house wren is entirely beneficial. He may be said to live upon animal food alone, for an examination of 88 stomachs showed that 98 per cent of the contents was made up of insects or their allies, and only 2 per cent was vegetable food, including bits of grass and similar matter, evidently taken by accident with the insects. Half of this food consisted of grasshoppers and beetles; the remainder of caterpillars, bugs, and spiders. As the wren is a prolific breeder, frequently rearing in a season from 12 to 16 young, a family of these birds must cause considerable reduction in the number of insects in a garden. Wrens are industrious foragers, searching every tree, shrub, and vine for caterpillars, and examining every post and rail of the fence and every cranny in the wall for insects or spiders.

The house wren is only one of a numerous group of small birds of similar habits. There are within the limits of the United States 28 species and subspecies of wrens, occupying more or less completely the whole country from the Atlantic to the Pacific. With the exception of the marsh wrens,[2] they all appear to prefer some cosy nook for a nesting site, and, as it happens, the farm buildings afford just the place desired. This has led several of the wrens to seek out the habitations of man, and he is benefited by their destruction of noxious insects. No species of wren has been accused of harm, and their

[1] *Troglodytes ædon.* [2] *Telmatodytes palustris.*

presence should be encouraged about every farm, ranch, village, or suburban residence.

BROWN THRASHER.

The brown thrasher[1] (fig. 5) breeds throughout the United States east of the Great Plains, and winters in the South Atlantic and Gulf States. It occasionally visits the garden or orchard, but nests in swamps or in groves standing upon low ground. The thrasher's favorite time for singing is in early morning, when, perched on the top of a tall bush or low tree, it gives an exhibition of vocal powers which would do credit to a mocking bird. Indeed, in the South, where the latter bird is abundant, the thrasher is known as the sandy mocker.

FIG. 5.—Brown thrasher. Length, about 11 inches.

The food of the brown thrasher consists of both fruit and insects. An examination of 636 stomachs showed 36 per cent of vegetable and 64 of animal food, practically all insects, and mostly taken in spring before fruit was ripe. Half the insects were beetles and the remainder chiefly grasshoppers, caterpillars, bugs, and spiders. A few predacious beetles were eaten, but on the whole the work of the species as an insect destroyer may be considered beneficial.

Eight per cent of its food is made up of fruits like raspberries and currants which are or may be cultivated, but the raspberries at least are as likely to belong to wild as to cultivated varieties. Grain, made up mostly of scattered kernels of oats and corn, is merely a trifle, amounting to only 3 per cent. Though some of the corn may be taken from newly planted fields, it is amply paid for by the destruction of May beetles which are eaten at the same time. The rest of the food consists of wild fruit or seeds. Taken all in all, the brown thrasher is a useful bird, and probably does as good work in its secluded retreats as it would about the garden, for the swamps and groves are no doubt the breeding grounds of many insects that migrate thence to attack the crops of the farmer.

FIG. 6.—Catbird. Length, about 9 inches.

CATBIRD.

The catbird[2] (fig. 6), like the thrasher, is a lover of swamps and delights to make its home in a tangle of wild grapevines, greenbriers, and shrubs, where it is safe from attack and can find its favorite food in abundance. It is found throughout the United States west to the Rocky Mountains, and extends also from Washington, Idaho, and Utah northward into the provinces of Canada. It winters in the Southern States, Cuba, Mexico, and Central America.

Reports from the Mississippi Valley indicate that the catbird is sometimes a serious annoyance to fruit growers. The reason for such reports may possibly be found in the fact that on the prairies fruit-bearing shrubs, which afford so large a part of this bird's food, are conspicuously absent. With the settlement of this region comes an extensive planting of orchards, vineyards, and small-fruit gardens, which furnish shelter and nesting sites for the catbird as well as for other species. There is in consequence a large increase in the numbers

[1] *Toxostoma rufum.* [2] *Dumetella carolinensis.*

of the birds, but no corresponding gain in the supply of native fruits upon which they were accustomed to feed. Under these circumstances what is more natural than for the birds to turn to cultivated fruits for their food? The remedy is obvious: Cultivated fruits can be protected by the simple expedient of planting the wild species which are preferred by the birds. Some experiments with catbirds in captivity show that the Russian mulberry is preferred to any cultivated fruit.

The stomachs of 645 catbirds were examined and found to contain 44 per cent of animal (insect) and 56 per cent of vegetable food. Ants, beetles, caterpillars, and grasshoppers constitute three-fourths of the animal food, the remainder being made up of bugs, miscellaneous insects, and spiders. One-third of the vegetable food consists of cultivated fruits, or those which may be cultivated, as strawberries, raspberries, and blackberries; but while we debit the bird with the whole of this, it is probable—and in the eastern and well-wooded part of the country almost certain—that a large part is obtained from wild vines. The rest of the vegetable matter is mostly wild fruit, as cherries, dogwood, sour gum, elderberries, greenbrier, spiceberries, black alder, sumac, and poison ivy. Although the catbird sometimes does considerable harm by destroying small fruit, it can not on the whole be considered injurious. On the contrary, in most parts of the country it does far more good than harm.

FIG. 7.—Barn swallow. Length, about 7 inches.

THE SWALLOWS.

Seven common species of swallows are found within the limits of the United States, four of which have abandoned to some extent their primitive nesting habits and have attached themselves to the abodes of man.

In the eastern part of the country the barn swallow[1] (fig. 7) now builds exclusively under roofs, having entirely abandoned the rock caves and cliffs in which it formerly nested. More recently the cliff swallow[2] has found a better nesting site under the eaves of buildings than was afforded by the overhanging cliffs of earth or stone which it once used and to which it still resorts occasionally in the East and habitually in the unsettled West. The martin[3] and the white-bellied, or tree, swallow[4] nest either in houses supplied for the purpose, in abandoned nests of woodpeckers, or in natural crannies in rocks. The northern violet-green swallow,[5] the rough-winged swallow,[6] and the bank swallow[7] still live in practically such places as their ancestors chose.

Field observation convinces an ordinarily attentive person that the food of swallows must consist of the smaller insects captured in mid-air or picked from the tops of tall grass or weeds. This observation is borne out by an examination of stomachs, which shows that the food is made up of many small species of beetles which are much on the wing; many species of mosquitoes and their allies, together with large quantities of flying ants; and a few insects of similar kinds. Most of these are either injurious or annoying, and the numbers destroyed by swallows are not only beyond calculation but almost beyond imagination.

Unlike many other groups of birds, the six species of swallows found in the Eastern States extend in a practically unchanged form across the continent, where they are reinforced by the northern, or Pacific-coast, violet-green swallow.

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[1] *Hirundo erythrogastra.*
[2] *Petrochelidon lunifrons.*
[3] *Progne subis.*
[4] *Iridoprocne bicolor.*
[5] *Tachycineta thalassina.*
[6] *Stelgidopteryx serripennis.*
[7] *Riparia riparia.*

It is a mistake to tear down from the eaves of a barn the nests of a colony of cliff swallows, for so far from disfiguring a building they make a picturesque addition to it, and the presence of swallows should be encouraged by every device. It is said that cliff and barn swallows may be induced to build their nests in a particular locality, otherwise suitable, by providing a quantity of mud to be used by them as mortar. Barn swallows may also be encouraged by cutting a small hole in the gable of the barn, while martins and white-bellied swallows will be grateful for boxes like those for the bluebird, but placed in a higher situation.

TOWHEE.

The towhee, chewink, or ground robin[1] (fig. 8), as it is variously known, inhabits nearly the whole of the United States east of the Great Plains. It breeds from the Middle States northward and winters in the southern half of the country. Naturally associated with the catbird and brown thrasher, it lives in much the same places, though it is more given to haunting hedgerows along roads and fences. After snow has disappeared in early spring an investigation of the rustling so often heard among the leaves near a fence or in a thicket will frequently disclose a towhee hard at work scratching for his dinner after the manner of a hen; and in these places and along the sunny border of woods old leaves will be found overturned where the bird has been searching for hibernating beetles and larvæ. The good which the towhee does in this way can hardly be overestimated, since the death of a single insect at this time, before it has had an opportunity to deposit its eggs, is equivalent to the destruction of a host later in the year. The towhee has also been credited with visiting potato fields and feeding upon the potato beetle. Its vegetable food consists of seeds and small wild fruits, but no complaint on this score is known to have been made. So far as observation goes, the bird never touches either cultivated fruit or grain; in fact, it is too shy and retiring even to stay about gardens for any length of time.

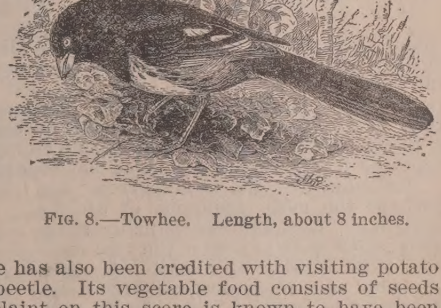

FIG. 8.—Towhee. Length, about 8 inches.

THE SPARROWS.[2]

Sparrows are not obtrusive birds, either in plumage, song, or action. There are some 40 species, with nearly as many subspecies, in North America. Not more than half a dozen forms are generally known in any one locality. All the species are more or less migratory, but so widely are they distributed that there is probably no part of the country where some can not be found throughout the year.

While sparrows are noted seed eaters, they do not by any means confine themselves to a vegetable diet. During the summer, and especially in the breeding season, they eat many insects and feed their young largely upon the same food. Examination of stomachs of three species—the song sparrow[3] (fig. 9), chipping sparrow,[4] and field sparrow[5] (fig. 10)—shows that about one-third of the food consists of insects, comprising many injurious beetles, as snout beetles or weevils, and leaf beetles. Many grasshoppers are eaten. In the case of the chipping sparrow these insects form one-eighth of the food. Grasshoppers would seem to be rather large morsels, but the bird probably confines itself to the smaller species; indeed, the greatest amount (over 36 per

[1] *Pipilo erythrophthalmus.*

[2] The sparrows here mentioned are all native species. A full account of the English, or house, sparrow (*Passer domesticus*), including its introduction, habits, and depredations, was published in Bul. No. 1 of the Division of Ornithology in 1889. For information in regard to combating the English sparrow, see Farmers' Bulletin 493, The English Sparrow as a Pest, by Ned Dearborn, 1912.

[3] *Melospiza melodia.*

[4] *Spizella passerina.*

[5] *Spizella pusilla.*

cent) is eaten in June, when the larger species are still young and the smaller most numerous. Besides the insects already mentioned, many wasps and bugs are taken. Predacious and parasitic hymenopterous insects and predacious beetles, all useful, are eaten only to a slight extent, so that as a whole the insect diet of the native sparrows may be considered beneficial. There are several records of potato-bug larvæ eaten by chipping sparrows.

FIG. 9.—Song sparrow. Length, about 6½ inches.

Their vegetable food is limited almost exclusively to hard seeds. This might seem to indicate that the birds feed to some extent upon grain, but the stomachs examined show only one kind, oats, and but little of that. The great bulk of the food is made up of grass and weed seed, which form almost the entire diet during winter, and the amount consumed is immense.

In the agricultural region of the upper Mississippi Valley, by roadsides, on borders of cultivated fields, or in abandoned fields, wherever they can obtain a foothold, masses of rank weeds spring up and often form almost impenetrable thickets which afford food and shelter for immense numbers of birds and enable them to withstand great cold and the most terrible blizzards. A person visiting one of these weed patches on a sunny morning in January, when the thermometer is 20° or more below zero, will be struck with the life and animation of the busy little inhabitants. Instead of sitting forlorn and half frozen, they may be seen flitting from branch to branch, twittering and fluttering, and showing every evidence of enjoyment and perfect comfort. If one of them is captured it will be found in excellent condition; in fact, a veritable ball of fat.

The snowbird[1] and tree sparrow[2] are perhaps the most numerous of all the sparrows. Examination of many stomachs shows that in winter the tree sparrow feeds entirely upon seeds of weeds. Probably each bird consumes about one-fourth of an ounce a day. In an article contributed in 1881 to the New York Tribune the writer estimated the amount of weed seed annually destroyed by these birds in Iowa. On the basis of one-fourth of an ounce of seed eaten daily by each bird, and an average of ten birds to each square mile, remaining in their winter range 200 days, there would be a total of 1,750,000 pounds, or 875 tons of weed seed consumed in a single season by this one species. Large as are these figures, they unquestionably fall far short of the reality. The estimate of 10 birds to a square mile is very conservative, for in Massachusetts, where the food supply is less than in the Western States, the tree sparrow is even more abundant than this in winter. The writer has known places in Iowa where several thousand tree sparrows could be seen within the space of a few acres. This estimate, moreover, is for a single species, while, as a matter of fact, there are at least half a dozen birds (not all sparrows) that habitually feed during winter on these seeds. Farther south the tree sparrow is replaced in winter by the white-throated sparrow,[3] the white-crowned sparrow,[4] the fox sparrow,[5] the song sparrow, the field sparrow, and several others;

FIG. 10.—Field sparrow. Length, about 5½ inches.

[1] *Junco hyemalis.*
[2] *Spizella monticola.*
[3] *Zonotrichia albicollis.*
[4] *Zonotrichia leucophrys.*
[5] *Passerella iliaca.*

so that all over the land a vast number of these seed eaters are at work during the colder months reducing next year's crop of worse than useless plants.

HOUSE FINCH.

Of all the sparrow group, there is probably no member, unless it be the exotic form known as the English sparrow,[1] that has by reason of its food habits called down so many maledictions upon its head as the house finch,[2] red head, or linnet, as it is variously called. This bird, like the other members of its family, is by nature a seed eater, and before the beginning of fruit raising in California probably subsisted upon the seeds of weeds, with an occasional taste of some wild berry. Now, however, when orchards have extended throughout the length and breadth of the State and every month from May to December sees some ripening fruit, the linnets take their share. As their name is legion, the sum total of the fruit that they destroy is more than the fruit raiser can well spare. As the bird has a stout beak, it has no difficulty in breaking the skin of the hardest fruit and feasting upon the pulp, thereby spoiling the fruit and giving weaker-billed birds a chance to sample and acquire a taste for what they might not otherwise have molested. Complaints against this bird have been many and loud, more especially in the years when fruit crops first came to be an important factor in the prosperity of the Pacific coast. At that time the various fruits afforded the linnets a new and easily obtained food, while cultivation had reduced their formerly abundant supply of weed seed. When the early fruit growers saw their expected golden harvest suddenly snatched away or at least much reduced in value by the little marauders, it is no wonder that they were exasperated and wished to destroy the authors of the mischief.

In order to test the matter thoroughly and ascertain whether these birds ate any other kind of food that might to some extent offset the damage inflicted upon the fruit, the horticulturists and ornithologists of California were requested to secure a number of the stomachs of these birds and send them to the Biological Survey. An agent was also sent to the fruit-raising sections, who watched the birds in the orchards and collected a number of them. In this way 1,206 stomachs were obtained and carefully examined, and the result shows that animal food (insects) constituted 2.44 per cent and vegetable food 97.56 per cent of the stomach contents, not counting gravel.

So small a proportion of animal food can not of course, mean a great destruction of insects. As these stomachs were collected in every month, with the greater number taken during the summer, it is evident that whatever good one may expect from the linnet must not be looked for in this direction. Unlike most of the sparrow family, the linnet does not feed its young upon insects to any great extent. The contents of the stomachs of a number of nestlings were carefully examined, and the only animal food was found to consist of woolly plant lice. These also constituted the great bulk of the animal food eaten by adults.

The vegetable food of the species consists of three principal items—grain, fruit, and weed seeds. Grain amounts to less than 1½ per cent in August, which is the month of greatest consumption, and the average for the year is a trifle more than one-fourth of 1 per cent. Fruit attains its maximum in September, when it amounts to 27 per cent of the whole food, but the average for the year is only 10 per cent. The seeds of weeds constitute the bulk of the diet of the linnet, and in August, the month of least consumption, amount to about 64 per cent of the food. The average for the year is 86 per cent.

From the foregoing it is evident that whatever the linnet's sins may be, grain eating is not one of them. In view of the great complaint made against its fruit-eating habit, the small quantity found in the stomachs taken is somewhat of a surprise. But it must be remembered that the stomach contents do not tell the whole story. When a bird takes a single peck from a cherry or an apricot, it spoils the whole fruit, and in this way may ruin half a dozen in taking a single meal. It is safe to say that the fruit pulp found in the stomach does not represent more than one-fifth of what is actually destroyed. That the linnets are persistent and voracious eaters of early fruits, especially cherries and apricots, every fruit raiser in California will bear testimony. That the damage is often serious no one will deny. It is noticeable, however, that

[1] *Passer domesticus.* [2] *Carpodacus mexicanus frontalis.*

the earliest varieties are the ones most affected; also, that in large orchards the damage is not perceptible, while in small plantations the whole crop is frequently destroyed.

THE GRACKLES.

The crow blackbird or grackle[1] (fig. 11) in one or more of its subspecies is a familiar object in all the States east of the Rocky Mountains. Throughout the year it is resident as far north as southern Illinois, and in summer extends its range into the Canadian Provinces. In the Mississippi Valley it is one of the most abundant of birds, preferring to nest in the artificial groves and windbreaks near farms instead of in the natural "timber" which it formerly used. It breeds also in parks and near buildings, often in considerable colonies. Farther east, in New England, it is only locally abundant, though frequently seen in migration. In the latter days of August and throughout September it is found in immense numbers before moving southward.

The grackle is accused of many sins, such as stealing grain and fruit and robbing the nests of other birds. An examination of 2,346 stomachs shows that nearly one-third of its food consists of insects, most of which are injurious. The bird also eats a few snails, crawfishes, salamanders, small fish, and occasionally a mouse. The stomach contents do not indicate that it robs other birds' nests to any great extent, as remains of birds and birds' eggs amount to less than half of 1 per cent.

It is on account of its vegetable food that the grackle most deserves condemnation. Grain is eaten during the whole year, and only for a short time in summer is other food attractive enough to induce the bird to alter its diet. The grain taken in winter and spring probably consists of waste kernels from the stubble. The stomachs do not indicate that the bird pulls sprouting grain; but the wheat eaten in July and August and the corn eaten in fall are probably from fields of standing grain. The total amount of grain consumed during the year constitutes 45 per cent of the food, but it is safe to say that at least half is waste grain and consequently of no value. Although the crow blackbird eats a few cherries and blackberries in their season, and in the fall some wild fruit, it apparently does no damage in this way.

FIG. 11.—Purple grackle. Length, about 12 inches.

Large flocks of grackles no doubt do considerable injury to grain crops, and there seems to be no remedy, except the destruction of the birds, which is in itself expensive. During the breeding season, however, the species does much good by eating insects and by feeding them to its young, which are reared almost entirely upon this food. The bird does the greatest amount of good in spring, when it follows the plow in search of large grubworms, of which it is so fond that it sometimes literally crams its stomach full of them.

BREWER BLACKBIRD.

The Brewer blackbird[2] takes the place in the Western States of the grackle, or crow blackbird, which lives in the Mississippi Valley and farther east and is very similar in appearance and habits. It breeds east to the Great Plains and north into Canada, and winters over most of its breeding range in the United States and south to Guatemala. At home in fields, meadows, and orchards, and about ranch buildings and cultivated lands generally, it nests in bushes and weeds, sometimes in trees, and is very gregarious, especially about barnyards and corrals. The bird feeds freely in stockyards and in cultivated fields, and when fruit is ripe does not hesitate to take a share. During the cherry season in California the birds are much in the orchards. In one case they were

[1] *Quiscalus quiscula.* [2] *Euphagus cyanocephalus.*

observed feeding on cherries, but when a neighboring fruit grower began to plow his orchard almost every blackbird in the vicinity was upon the newly opened ground close after the plowman's heels in its eagerness to secure the insects turned up.

The laboratory investigation of this bird's food covered 312 stomachs, collected in every month and representing especially the fruit and grain sections of southern California. The animal portion of the food was 32 per cent and the vegetable 68 per cent.

Caterpillars and their pupæ amounted to 12 per cent of the whole food and were eaten every month. They include many of those pests known as cutworms. The cotton-boll worm, or corn-ear worm, was identified in at least 10 stomachs, and in 11 were found pupæ of the codling moth. The animal food also included other insects, and spiders, sow bugs, snails, and eggshells.

The vegetable food may be divided into fruit, grain, and weed seeds. Fruit was eaten in May, June, and July, not a trace appearing in any other month, and was composed of cherries, or what was thought to be such, strawberries, blackberries or raspberries, and fruit pulp or skins not further identified. However, the amount, a little more than 4 per cent for the year, was too small to make a bad showing, and if the bird does no greater harm than is involved in its fruit eating it is well worth protecting. Grain amounts to 54 per cent of the yearly food and forms a considerable percentage in each month; oats are the favorite and were the sole contents of 14 stomachs, and wheat of 2, but no stomach was completely filled with any other grain. Weed seeds, eaten in every month to the extent of 9 per cent of the food, were found in rather small quantities and irregularly, and appear to have been merely a makeshift.

Stomachs of nestlings, varying in age from 24 hours to some that were nearly fledged, were found to contain 89 per cent animal to 11 per cent vegetable matter. The largest items in the former were caterpillars, grasshoppers, and spiders. In the latter the largest items were fruit, probably cherries; grain, mostly oats; and rubbish.

BALTIMORE ORIOLE.

FIG. 12.—Baltimore oriole. Length, about 7½ inches.

Brilliancy of plumage, sweetness of song, and food habits to which no exception can be taken are some of the striking characteristics of the Baltimore oriole[1] (fig. 12). In summer it is found throughout the northern half of the United States east of the Great Plains. Its nest commands hardly less admiration than the beauty of its plumage or the excellence of its song. Hanging from the tip of the outermost bough of a stately elm, it is almost inaccessible to depredators and so strongly fastened as to bid defiance to the elements.

Observation both in the field and laboratory shows that caterpillars constitute the largest item of the fare of the oriole. In 204 stomachs they formed 34 per cent of the food, and they are eaten in varying quantities during all the months in which the bird remains in this country. The fewest are eaten in July, when a little fruit also is taken. The other insects consist of beetles, bugs, ants, wasps, grasshoppers, and some spiders. The beetles are principally click beetles, the larvæ of which are among the most destructive insects known; and the bugs include plant and bark lice, both very harmful, but so small and obscure as to be passed over unnoticed by most birds. Ants are eaten mostly in spring, grasshoppers in July and August, and wasps and spiders with considerable regularity throughout the season.

During the stay of the oriole in the United States, vegetable matter amounts to only a little more than 16 per cent of its food, so that the possibility of its doing much damage to crops is very limited. The bird is accused of eating peas to a considerable extent, but remains of such were found in only two cases. One writer says that it damages grapes, but none were found in the stomachs.

[1] *Icterus galbula.*

BULLOCK ORIOLE.

The Bullock oriole[1] is practically a counterpart of the Baltimore oriole, taking the place of that species west of the Plains and throughout the Pacific coast region. It does not essentially differ in its habits of nesting or in its food from its eastern relative, but it is less beautiful in plumage. The examination of 162 stomachs shows that 79 per cent of its food consists of insects, with a few spiders, a lizard, a mollusk shell, and eggshells. Beetles amounted to 35 per cent, and all except a few ladybugs were harmful species. Ants were found in 19 stomachs, and in one there was nothing else. Bees, wasps, etc., were in 56 stomachs, and entirely filled 2 of them. Including the ants, they amount to nearly 15 per cent of the food of the season.

One of the most interesting articles of food in the oriole's dietary was the black olive scale, found in 45 stomachs, and amounting to 5 per cent of the food. In several cases these scales formed 80 per cent or more of the contents, and in one, 30 individual scales could be counted. They were evidently a standard article of diet, and were eaten regularly in every month of the oriole's stay except April. Hemipterous insects other than scales, eaten quite regularly, make up a little more than 5 per cent of the food. They were mostly stinkbugs, leaf hoppers, and tree hoppers. Plant lice were found in one stomach.

Moths, pupæ, and caterpillars compose the largest item of the oriole's animal food. The average consumption during its summer stay is a little more than 41 per cent. Of these, perhaps the most interesting were the pupæ and larvæ of the codling moth. These were found in 23 stomachs, showing that they are not an unusual article of diet. No less than 14 of the pupa cases were found in one stomach, and as they are very fragile many others may have been present, but broken beyond recognition.

Grasshoppers probably do not come much in the oriole's way. They were eaten, however, to the extent of a little more than 3 per cent. But in spite of the fact that grasshoppers are eaten so sparingly, 2 stomachs, both taken in June, contained nothing else, and another contained 97 per cent of them.

Various insects and spiders, with a few other items, make up the rest of the animal food, a little more than 5 per cent. Spiders are not important in the oriole's food, but are probably eaten whenever found. They were identified in 44 stomachs, but in small numbers. The scales of a lizard were found in one stomach and the shell of a snail in another.

The vegetable contingent of the oriole's food is mostly fruit, especially in June and July, when it takes kindly to cherries and apricots, and sometimes eats more than the fruit grower considers a fair share. However, no great complaint is made against the bird, and it is probable that as a rule it does not do serious harm. With such a good record as an insect eater it can well be spared a few cherries.

THE MEADOWLARKS.

The eastern meadowlark[2] (fig. 13) is a common and well-known bird occurring from the Atlantic coast to the Great Plains, where it gives way to the closely related western species,[3] which extends thence westward to the Pacific. It winters from our southern border as far north as the District of Columbia, southern Illinois, and occasionally Iowa. The western form winters somewhat farther north. Although it is a bird of the plains, and finds its most congenial haunts in the prairies of the West, it is at home wherever there is level or undulating land covered with grass or weeds, with plenty of water at hand.

In the 1,514 stomachs examined, animal food (practically all insects) constituted 74 per cent of the contents and vegetable matter 26 per cent. As would naturally be supposed, the insects were ground species, as beetles, bugs, grasshoppers, and caterpillers, with a few flies, wasps, and spiders. A number of the stomachs were collected when the ground was covered with snow, but even these contained a large percentage of insects, showing the bird's skill in finding proper food under adverse circumstances.

Of the various insects eaten, crickets and grasshoppers are the most important, constituting 26 per cent of the food of the year and 72 per cent of the food in August. It is scarcely necessary to mention the beneficial effect of a number of these birds on a field of grass in the height of the grasshopper season. Of the 1,514 stomachs collected at all seasons of the year, 778, or more

[1] *Icterus bullocki.* [2] *Sturnella magna.* [3] *Sturnella neglecta.*

than half, contained remains of grasshoppers, and one was filled with fragments of 37 of these insects. This seems to show conclusively that grasshoppers are preferred, and are eaten whenever they can be found. Especially notable is the great number taken in August, the month when grasshoppers reach their maximum abundance; stomach examination shows that large numbers of birds resort at this time to this diet, no matter what may be the food during the rest of the year.

Next to grasshoppers, beetles make up the most important item of the meadowlark's food, amounting to 25 per cent, about one-half of which are predacious ground beetles. The others are all harmful species.

Forty-two individuals of different kinds of May beetles were found in the stomachs of meadowlarks, and there were probably many more which were past recognition. To this form and several closely allied ones belong the numerous white grubs, which are among the worst enemies to many cultivated crops, notably grasses and grains, and to a less extent strawberries and garden vegetables. In the larval stage they eat the roots of these plants, and being large, one individual may destroy several plants. In the adult stage they feed upon the foliage of trees and other plants, and in this way add to the damage which they began in the earlier form. As these enemies of husbandry are not easily destroyed by man, it is obviously wise to encourage their natural foes.

Among the weevils found in the stomachs the most important economically are the cotton-boll weevil and the recently introduced alfalfa weevil of Utah. Several hundred meadowlarks were taken in the cotton-growing region, and the boll weevil was found in 25 stomachs of the eastern meadowlark and in 16 of the western species. Of the former, one stomach contained 27 individuals. Of 25 stomachs of western meadowlarks taken in alfalfa fields of Utah, 15 contained the alfalfa weevil. In one stomach 23 adults were found, in another 32 adults and 70 larvæ, still another had 10 adults and 40 larvæ, while a fourth had 4 adults and 100 larvæ.

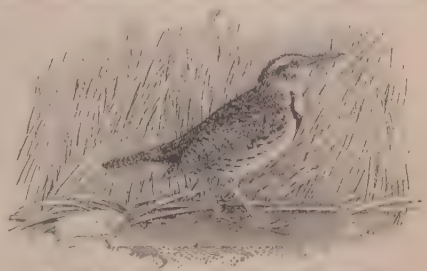

FIG. 13.—Meadowlark. Length, about 10 inches.

Caterpillars form a very constant element of the food, and in May constitute over 24 per cent of the whole. May is the month when the dreaded cutworm begins its deadly career, and then the lark does some of its best work. Most of these caterpillars are ground feeders, and are overlooked by birds which habitually frequent trees, but the meadowlark finds and devours them by thousands. The remainder of the insect food is made up of ants, wasps, and spiders, with some bugs, including chinch bugs, and a few scales.

The vegetable food consists of grain and weed and other hard seeds. Grain in general amounts to 11 per cent and weed and other seeds to 7 per cent. Grain, principally corn, is eaten mostly in winter and early spring and consists, therefore, of waste kernels; only a trifle is consumed in summer and autumn, when it is most plentiful. No trace of sprouting grain was discovered. Clover seed was found in only six stomachs, and but little in each. Seeds of weeds, principally ragweed, barnyard grass, and smartweed, are eaten from November to April, inclusive, but during the rest of the year are replaced by insects.

Briefly stated, more than half of the meadowlark's food consists of harmful insects; its vegetable food is composed either of noxious weeds or waste grain, and the remainder is made up of useful beetles or neutral insects and spiders. A strong point in the bird's favor is that, although naturally an insect eater, it is able to subsist on vegetable food, and consequently is not forced to migrate in cold weather farther than is necessary to find ground free from snow.

THE RED-WINGED BLACKBIRDS.

The red-winged or swamp blackbird[1] in its various forms (fig. 14) is found all over the United States and the region immediately to the north. While

[1] *Agelaius phœniceus.*

common in most of its range, its distribution is more or less local, mainly on account of its partiality for marshes. It builds its nest over or near standing water, in tall grass, rushes, or bushes. Owing to this peculiarity the bird may be absent from large tracts of country which afford no swamps or marshes suitable for nesting. It usually breeds in large colonies, though single families, consisting of a male and several females, may sometimes be found in a small slough, where each female builds her nest and rears her own little brood, while her liege lord displays his brilliant colors and struts in the sunshine. In the upper Mississippi Valley the species finds most favorable conditions, for the countless prairie sloughs and the margins of the numerous shallow lakes afford nesting sites for thousands of red-wings; and here are bred the immense flocks which sometimes do so much damage to the grain fields of the West. After the breeding season the birds congregate preparatory to migration, and remain thus associated throughout the winter.

Three species and several subspecies of red-wings are recognized,[1] but practically no difference exists in the habits of these forms either in nesting or feeding, except such as may result from local conditions. Most of the forms are found on the Pacific side of the continent, and may be considered as included in the following statements as to food and economic status.

Many complaints have been made against the red-wing, and several States have at times placed a bounty upon its head. It is said to cause great damage to grain in the West, especially in the upper Mississippi Valley, but no complaints come from the northeastern section, where the bird is much less abundant than in the West and South.

FIG. 14.—Red-winged blackbird. Length, about 9½ inches.

Examination of 1,083 stomachs showed that vegetable matter forms 74 per cent of the food, while animal matter, mainly insects, forms but 26 per cent. A little more than 10 per cent consists of beetles, mostly harmful species. Weevils, or snout beetles, amount to 4 per cent of the year's food, but in June reach 25 per cent. As weevils are among the most harmful insects known, their destruction should condone some, at least, of the sins of which the bird is accused. Grasshoppers constitute nearly 5 per cent of the food, while the rest of the animal matter is made up of various insects, a few snails, and crustaceans. The few dragon flies found were probably picked up dead, for they are too active to be taken alive, unless by a bird of the flycatcher family. So far as the insect food as a whole is concerned, the red-wing may be considered entirely beneficial.

The interest in the vegetable food of this bird centers around grain. Only three kinds, corn, wheat, and oats, were found in the stomachs in appreciable quantities. They aggregate but little more than 13 per cent of the whole food, oats forming nearly half of this amount. In view of the many complaints that the red-wing eats grain, this record is surprisingly small. The purple grackle has been found to eat more than three times as much. In the case of the crow, corn forms one-third of the food, so that the red-winged blackbird, whose diet is made up of only a trifle more than one-eighth of grain, is really one of the least destructive species. The most important item of the bird's food, however, is weed seed, which forms practically all of its food in winter and about 57 per cent of the fare of the whole year. The principal weed seeds eaten are those of ragweed, barnyard grass, and smartweed. That these seeds are preferred is shown by the fact that the birds begin to eat them in August, when grain is still readily obtainable, and continue feeding on them even after insects become plentiful in April. The red-wing eats very little fruit and does practically no harm to garden or orchard. Nearly seven-eighths of its food is made up of weed seed or of insects injurious to agriculture, indicating unmistakably that

[1] *Agelaius phœniceus* (8 forms), *Agelaius gubernator*, and *Agelaius tricolor*.

the bird should be protected, except, perhaps, in a few places where it is overabundant.

BOBOLINK.

The bobolink, rice bird, or reed bird [1] (fig. 15) is a common summer resident of the United States, north of about latitude 40°, and from New England westward to the Great Plains, wintering beyond our southern border. In New England there are few birds about which so much romance clusters as this rollicking songster, naturally associated with sunny June meadows; but in the South there are none on whose head so many maledictions have been heaped on account of its fondness for rice. During its sojourn in the Northern States it feeds mainly upon insects and seeds of useless plants; but while rearing its young, insects constitute its chief food, and almost the exclusive diet of its brood. After the young are able to fly, the whole family gathers into a small flock and begins to live almost entirely upon vegetable food. This consists for the most part of weed seeds, since in the North these birds do not appear to attack grain to any great extent. They eat a few oats, but their stomachs do not reveal a great quantity of this or any other grain. As the season advances they gather into larger flocks and move southward, until by the end of August nearly all have left their breeding grounds. On their way they frequent the reedy marshes about the mouths of rivers and on the inland waters of the coast region and subsist largely upon wild rice. In the Middle States, during their southward migration, they are commonly known as reed birds, and becoming very fat are treated as game.

FIG. 15.—Bobolink, rice bird, or reed bird. Length, about 7 inches.

Formerly, when the low marshy shores of the Carolinas and some of the more southern States were devoted to rice culture the bobolinks made great havoc both upon the sprouting rice in spring and upon the ripening grain on their return migration in the fall. With a change in the rice-raising districts, however, this damage is no longer done.

CROW.

In one or another of its geographic races the common crow [2] (fig. 10) breeds in great numbers throughout the States east of the Plains and from the Gulf well up into Canada, while in less abundance it is found in California and in the Northwestern States. During the colder months a southern migratory movement brings most of these birds within the borders of the United States, and at about the latitude of Philadelphia and southern Illinois we find them congregating nightly in roosts. Farmers dwelling in the vicinity of such roosts frequently suffer losses to shocked corn.

In fact none of our native birds so much concerns the average farmer of the Eastern States as the common crow. Many of our present criticisms of this bird, as its pulling sprouting corn, feeding on ripening ears, damaging fruits of various kinds, destroying poultry and wild birds, and disseminating diseases of live stock, were common complaints in the days of the early colonists. Many of the virtues of the crow, now quite generally recognized, also have been matters of record for many years. In recent times, however, scientific study of these problems, including the examination of the stomachs of hundreds of crows secured in every month of the year and under a variety of conditions, has enabled us to render a much fairer verdict than was formerly possible.

[1] *Dolichonyx oryzivorus.* [2] *Corvus brachyrhynchos.*

The crow is practically omnivorous. During spring and early summer any form of insect life seems to make a desirable item in its diet, and in winter when hard pressed nothing in the animal or vegetable kingdoms which contains a morsel of nutriment is overlooked.

The insect food of the crow, which comprises about a fifth of its yearly sustenance, does much to atone for its misdemeanors. Grasshoppers, May beetles and their larvæ (white grubs), caterpillars, weevils, and wireworms stand out prominently. In 1,103 stomachs examined these highly injurious forms comprised over 80 per cent of the insect food. Grasshoppers are naturally taken in greatest abundance late in the season, September being the month of largest consumption, when they form about a fifth of the total food. May beetles and white grubs are eaten in every month except January, but occur most prominently in May. In June caterpillars are a favorite food, and weevils of various kinds are taken in varying quantities throughout summer and fall. About half of the remaining 20 per cent of insect food is composed of beneficial ground beetles, ladybirds, predacious bugs, and parasitic wasps, and related forms, the rest consisting of neutral or injurious forms. Numerous instances are on record where fields badly infested with white grubs or grasshoppers have been favorite resorts of crows, whose voracity has resulted in a material suppression of the pest. When the amount of food required to sustain the individual crow is considered, the work of these birds appears all the more important. Single stomachs containing upward of 50 grasshoppers are not uncommon. Thus in its choice of insect food the crow is rendering an important service to the farmer.

Fig. 16.—Crow. Length, about 19 inches.

In the other animal food of the crow are several items of the utmost economic importance. Spiders are taken in considerable numbers in May and June, but the yearly total is a little over 1 per cent of the food. In early spring crawfish are eagerly sought, and other aquatic food as fish and mollusks lend variety to the crow's bill of fare the year round. In the consumption of toads, salamanders, frogs, and some snakes, which together compose a little over 2 per cent of the yearly food, the crow is doubtless doing harm. Small rodents occurred in the stomachs collected nearly every month, but it is often difficult to determine whether small mammals found in birds' stomachs were taken alive or found dead.

From its carrion-eating habits the crow has been unfairly criticized as a disseminator of live-stock diseases. While this may be to some extent just, the fact that there are many other important carriers which lie largely beyond our control, shows that we must seek final relief only through the strictest methods of sanitation.

The nest-robbing habit of the crow, long a serious criticism, is verified by stomach analysis. Fifty of the 1,103 crows examined had fed on wild birds or their eggs, and the eggs of domestic fowls were found slightly more frequently. The crow's habit of rummaging about garbage piles may explain much of this latter material.

Of the vegetable food, corn, which is eaten every month, is the most important item and forms about a third of the yearly diet. Much of this, however, must be considered waste. Over 60 per cent is consumed from the first of November to the end of March. During the periods when corn is sprouting and when in the "roasting-ear" stage the crow is eating this grain at a rate considerably less than the yearly average, and the months of smallest consumption are July and August. At times, however, the damage to corn becomes a serious problem, and were it not possible to make use of such deterrents as coal tar upon seed corn there would be little friendship for the crow in some sections of the East. The "pulling" of corn is a trait most prevalent in small-field areas. Wheat and oats suffer similar damage at times, especially in the Northwestern States, where these grains predominate. About the only safeguard to ripening grain is the constant use of powder and shot or the scarecrow.

Various kinds of cultivated fruits also are eaten, and local damage to such crops as apples, melons, peas, beans, peanuts, and almonds is occasionally reported. In long, rigorous winters, the crow, like other birds, resorts to the fruit of numerous wild plants, as dogwood, sour gum, hackberry, smilax, and the several species of sumac and poison ivy.

Damage to the eggs of poultry may be reduced to a minimum by careful housing of laying hens, and the farmer can protect his sprouting grain to a large extent by the use of tar-coated seed. It will be well also to keep the crow within reasonable numbers on game preserves and public parks where it is desired to encourage the nesting of smaller birds. While legal protection is not needed for so wary an individual as the crow, it seems well, where local conditions have not aggravated some particular shortcomings of the bird, to allow it to continue the good services rendered to man in the destruction of noxious insects.

BLUE JAY.

The blue jay[1] (fig. 17) is a conspicuous member of our bird population east of the Plains, especially in autumn when his brilliant plumage contrasts vividly with the brown foliage. Even in winter he stays with us, though at this time he is less common along our northern border. In spring and summer, while by no means uncommon, the blue jay is not so often noticed, as the retiring disposition which he assumes during the breeding season assists in protecting him from enemies. This also allows him to carry on with considerable impunity that inglorious practice of nest robbing of which, in a measure, he has been rightfully accused.

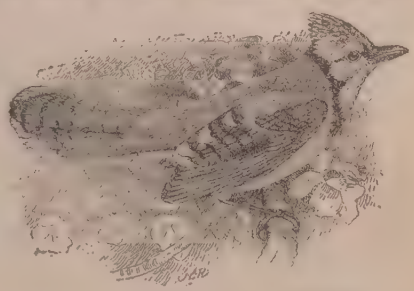

FIG. 17.—Blue jay. Length, about 11½ inches.

Examination of 530 stomachs collected at all times of the year in 30 of our Eastern States and Canada shows that insects comprise about 22 per cent of the yearly sustenance. About three-fourths of these are injurious, the remainder being neutral or beneficial. Of the injurious insects grasshoppers form the largest portion; in August nearly a fifth of the food. Caterpillars are conspicuous in July and August and at this time average about a tenth of the stomach contents. Both laboratory investigations and field observations have established the fact that in winter the eggs of the tent caterpillar and the hibernating larvæ of the brown-tail moth in New England are eagerly sought. Scarabæid beetles form about 4 per cent of the yearly food, and click beetles and wireworms about 1 per cent. Of the beneficial forms ground beetles (3 per cent) and hymenopterous insects, part of which are parasitic (2.5 per cent), are taken most frequently. A few other invertebrates, as spiders, millepeds, mollusks, and crustaceans, also are eaten throughout the year.

In the consideration of the vertebrate food of the blue jay we are confronted with the problem of the destruction of wild birds and their eggs. Special search was made for every possible trace of such material in the stomachs, and in 6 of the 530 were found the remains of wild birds or their eggs. In February two jays had killed a small bird apiece; in May one had robbed a nest of eggs; in June two had taken a small bird and a clutch of eggs, respectively; and in August another had robbed a nest. As this trait of the jay appears to be most pronounced during its own breeding season, it is quite possible for many birds which have suffered from his boldness early in the season to raise another brood unmolested. Thirty-nine of the 520 jays examined had fed on hen's eggs. Much of this food, however, was picked up about rubbish heaps to which the jay, like other members of the crow family, is partial. While the result of stomach analysis would appear to belittle this fault of the blue jay, it is doubtless quite characteristic of the bird under favorable conditions.

Complaint that the jay is the source of considerable damage to corn in the fall has been verified to a certain degree by stomach examination. This grain

[1] *Cyanocitta cristata.*

is taken in every month of the year, but in greater quantities during winter and early spring, when much of it is necessarily waste, and it forms about 18 per cent of the yearly food. Cultivated fruits of various kinds are eaten from June to the end of the year, and the 15 per cent taken in July apparently justifies complaints against the bird on this score. The favorite vegetable food of the blue jay is mast of various kinds, acorns predominating, but beechnuts, chestnuts, chinquapins, and hazelnuts also are relished. This food is important in every month but July and August, the yearly average being over 43 per cent, and from October to March it constitutes about two-thirds of the diet. Occasionally harm is done by feeding also on cultivated nuts, as pecans. Wild fruits are eaten during the summer and fall and constitute about 7 per cent of the yearly sustenance.

The blue jay probably renders its best services to man in destroying grasshoppers late in the season and in feeding on hibernating insects and their eggs, as they do in the case of the tent caterpillar and brown-tail moth. Such forest insects as buprestid beetles and weevils of various kinds also fall as their prey.

The blue jay's vegetable food, with the exception of some cultivated fruit and corn in the fall, is largely neutral. The severest criticism against the species is the destruction of other birds and their eggs. Where we wish to attract the latter in large numbers about our dooryards, in our parks, and in game preserves, it will be well not to allow the jays to become too abundant.

PACIFIC COAST JAYS.

In California and adjacent States two species of jays are much in evidence under several more or less well-marked forms.

The Steller jay[1] much resembles the eastern bird, but it is more shy and retiring and seldom visits the orchard or vicinity of the ranch buildings. Stomach examination shows that its food does not radically differ from that of the eastern blue jay. As is the case with that bird, a very considerable part of the food consists of mast, together with a little fruit and some insects. The insects are largely wasps, with some beetles and grasshoppers. The jay also eats some grain, which is probably waste or volunteer. No complaints, so far as known, are made against this bird. Until it shall become less wary it is not likely to trespass to a serious extent upon the farmer's preserve.

The California jay,[2] although of a different genus, more nearly resembles its eastern relative in food habits and actions. It freely visits the stockyards near ranch buildings, and orchards and gardens. As a fruit stealer it is notorious. One instance is recorded where seven jays were shot from a prune tree, one after the other, the dead bodies being left under the tree until all were killed. So eager were the birds to get the fruit that the report of the gun and the sight of their dead did not deter them from coming to the tree. In orchards in canyons or on hillsides adjacent to chaparral or other cover great mischief is done by this bird. In one such case an orchard was under observation at a time when the prune crop was ripening, and jays in a continuous stream were seen to come down a small ravine to the orchard, prey upon the fruit, and return.

Fruit stealing, however, is only one of the sins of the California jay. That it robs hens' nests is universal testimony. A case is reported of a hen having a nest under a clump of bushes; every day a jay came to a tree a few rods away, and when it heard the cackle of the hen announcing a new egg it flew at once to the nest. At the same time the mistress of the house hastened to the spot to secure the prize, but in most cases the jay won the race. This is only one of many similar cases recounted. The jays have learned just what the cackle of the hen means. Another case more serious is that related by a man engaged in raising white leghorn fowls on a ranch several miles up a canyon. He stated that when the chicks were very young the jays attacked and killed them by a few blows of the beak and then pecked open the skull and ate out the brains. In spite of all efforts to protect the chicks and kill the jays the losses in this way were serious.

Examination of the stomachs of 326 California jays shows that 27 per cent of the contents for the year consists of animal matter and 73 per cent of vegetable. Although the great bulk of the animal food is made up of insects, the remains of eggshells and birds' bones appear much too often. The insect food is fairly well distributed among the more common orders, but grasshoppers are

[1] *Cyanocitta stelleri.* [2] *Aphelocoma californica.*

slightly the most numerous and constitute 4.5 per cent of the year's food. In July, August, and September, however, the amount is 14, 18, and 19 per cent, respectively. Four per cent of the food consists of wasps, bees, etc., but in the three months named they constitute 15, 7, and 9 per cent, respectively. A worker honeybee found in each of two stomachs is rather surprising, for it is unusual to find a bird like the jay eating many of these active and elusive insects, which enter into the diet of the flycatchers. The remainder of the insect food is pretty evenly distributed among beetles, bugs, flies, and caterpillars. Eggshells were found in 21 stomachs and birds' bones in 5. Six stomachs contained the bones of mammals and two those of a lizard. No bird has a worse reputation for nest robbing than has the eastern jay, and yet of 530 stomachs of the eastern species only 6 contained eggshells or the bones of birds. This comparison serves to show what a marauder and nest thief the California jay really is.

In its vegetable diet this bird much resembles its eastern relative, the most remarkable difference being in the matter of fruit eating. With greater opportunities the California bird has developed a greater appetite for fruit and indulges it to the fullest extent. Remains of fruit were found in 220 of the 326 stomachs. The percentage for the year is only 16, but for the four months of June, July, August, and September it is 44, 33, 53, and 25, respectively. Cherries, apricots, and prunes are the favorites among cultivated fruits, and elderberries are relished to some extent. Grain, which was found in 48 stomachs, amounts to 6 per cent of the food of the year. Practically all of it was taken in the four months above mentioned, but it is not probable that much damage is done by the jay in this respect. The major portion of the grain was oats. What was not wild was probably simply scattered grain gleaned after the harvest. Mast is eaten by the California jay from September to March, inclusive, and constitutes during most of that period one of the principal elements of its food. In this respect the bird shows a remarkable similarity to the eastern species. A few weed seeds and other miscellaneous items make up the balance of the vegetable food.

In summing up from an economic point of view the character of the food of the California jay, it must be conceded that it is not all that could be wished. Its taste for birds' eggs and fruit is entirely too pronounced, and at present the species is superabundant in California. While the natural food supply of the bird has been lessened by bringing the woods and brushy canyons under cultivation, the same areas have been planted to fruit, and naturally the jay takes the fruit as an acceptable substitute. A considerable reduction of the bird's numbers would appear to be the only effective remedy.

THE PHŒBES.

Among the early spring arrivals to their northern homes none is more welcome than the phœbe (fig. 18). The common phœbe[1] breeds throughout the United States east of the Great Plains, and winters from the South Atlantic and Gulf States southward. Its western relative, the black phœbe,[2] is found from Texas west to the Pacific coast, which it occupies as far north as Washington, replacing through most of this region the common or eastern form.

Though naturally building its nest under an overhanging cliff of rock or earth, or in the mouth of a cave, the preference of the eastern species for the vicinity of farm buildings is so marked that in the more thickly settled parts of the country the bird is seldom seen at any great distance from a farmhouse, except where a bridge spanning a stream affords a secure spot for a nest. Its confiding disposition renders it a great favorite, and consequently it is seldom disturbed.

The phœbe subsists almost exclusively upon insects, most of which are caught upon the wing. An examination of 370 stomachs showed that over 89 per cent of the year's food consists of insects and spiders, while wild fruit constitutes the remainder. The insects belong chiefly to noxious species, and include many click beetles, May beetles, and weevils. Other beetles, belonging to 21 families that were identified, make up 10.65 per cent. They appear to be eaten very regularly in every month, but the most are taken in spring and early summer. May is the month of maximum consumption, with 20.43 per cent. Beetles altogether amount to 15.3 per cent, which places them second in rank of the items

[1] *Sayornis phœbe.* [2] *Sayornis nigricans.*

of animal food. The notorious cotton-boll weevil was found in six stomachs taken in the cotton fields of Texas and Louisiana, and five individuals of the strawberry weevil were taken from one collected in Texas. Many other beetles contained in the stomachs are equally harmful, but are not so widely known. Such are the corn leaf-beetle, which feeds upon corn; the 12-spotted cucumber beetle and the striped cucumber beetle, both of which seriously injure and sometimes destroy cucumber and squash vines; and the locust leaf miner, which is sometimes so numerous that all the locust trees over large areas are blasted as by fire.

In the phœbe's diet hymenopterous insects stand at the head, as in the case with most of the flycatchers. They are eaten with great regularity and are the largest item in nearly every month. A few are useful parasitic species, but these are offset by a number of sawfly larvæ, which are very harmful insects. Ants were found in 24 stomachs. No honeybees were identified. In their season grasshoppers are much relished, while wasps of various forms, many flies of species that annoy cattle, and a few bugs and spiders are also eaten regularly. It is evident that a pair of phœbes must materially reduce the number of insects near a garden or field, as the birds often, if not always, raise two broods a year, and each brood numbers from four to six young.

There is hardly a more useful species about the farm than the phœbe, and it should receive every encouragement. To furnish nesting boxes is helpful, but not necessary, as it usually prefers a more open situation, like a shed or a nook under the eaves, but it should be protected from cats and other marauders.

FIG. 18.—Phœbe. Length, about 6½ inches.

The black phœbe has the same habits as its eastern relative, both as to selection of food and nesting sites, preferring for the latter purpose some structure of man, as a shed or, better still, a bridge over a stream of water, and the preference of the black phœbe for the vicinity of water is very pronounced. One may always be found at a stream or pool and often at a watering trough by the roadside.

Careful study of the habits of the bird shows that it obtains a large portion of its food about wet places. While camping beside a stream in California the writer took some pains to observe the habits of the black phœbe. The nesting season was over, and the birds had nothing to do but eat. This they appeared to be doing all the time. When first observed in the morning, at the first glimmer of daylight, a phœbe was always found flitting from rock to rock, although it was so dusky that the bird could hardly be seen. This activity was kept up all day. Even in the evening, when it was so dark that notes were written by the aid of the camp fire, the phœbe was still engaged in its work of collecting, though it was difficult to understand how it could catch insects when there was scarcely light enough to see the bird. Exploration of the stream showed that every portion of it was patrolled by a phœbe, that each one apparently did not range over more than 12 or 13 rods of water, and that sometimes two or three were in close proximity.

The number of insects destroyed in a year by the black phœbe is enormous. Fortunately, the examination of stomachs has supplemented observation in the field, and we are enabled to give precise details. Of the 333 stomachs examined, every one contained insects as the great bulk of the food. Only 15 contained any vegetable food at all, and in no case was it a considerable part of the contents of the stomach. The insects eaten were mostly wasps, bugs, and flies, but many beetles also were destroyed.

Useful beetles belonging to three families amount to 2.8 per cent of the food. Other beetles of harmful or neutral species reach 10.5 per cent. Wasps, the largest item of the food, were found in 252 stomachs and were the whole contents of 15. The average for the year is 35 per cent. Parasitic species were noted, but they were very few. Ants were found in 48 stomachs, and for

a short time in midsummer they constitute a notable part of the food. Various wild bees and wasps make up the bulk of this item. No honeybees were found.

Bugs in various forms constitute 10.56 per cent and are eaten in every month but May. Stinkbugs appear to be the favorites, as they were contained in 10 stomachs. Plant lice were found in one stomach. Flies, forming the second largest item, were found in 97 stomachs and completely filled 3. They constitute the most regular article in the black phœbe's diet. The maximum consumption occurs in April, 64.3 per cent. The black phœbe well merits its title of flycatcher.

Moths and caterpillars amount to 8.2 per cent of the food. They were found in 72 stomachs, of which 51 contained the adult moths and 28 the larvæ or caterpillars. One stomach was entirely filled with adults. This is one of the few birds studied by the writer that eats more moths than caterpillars, for as a rule the caterpillars are largely in excess. Flycatchers, taking their food upon the wing, would naturally prove exceptions to the rule. Crickets are evidently not a favorite food of the black phœbe, as they amount to only 2.45 per cent. They were found in 39 stomachs, but usually the amount in each was small, though one stomach was entirely filled with them. Grasshoppers did not appear. Dragon flies were eaten to some extent, and these illustrate the fondness of the species for the neighborhood of water.

The vegetable matter eaten consisted chiefly of small wild fruits of no economic importance.

Another phœbe inhabiting the Western States and breeding as far north as Alaska is the Say phœbe.[1] Investigation of its food was based on the examination of 86 stomachs, and while none were available for the months when insects are most numerous, the bird proved to be one of the most exclusively insectivorous of the family. That it takes a few useful insects can not be denied, but these are far outnumbered by the harmful ones it destroys, and the balance is clearly in favor of the bird. Its vegetable food amounts to only 2 per cent and is made up of a little wild fruit, seeds, and rubbish.

THE KINGBIRDS.

The well-known eastern kingbird[2] (fig. 19) is essentially a lover of the orchard, though groves and the edge of forests were probably its original habitat. It breeds in the States east of the Rocky Mountains, and less commonly in the Great Basin and on the Pacific coast. Its hostility to hawks and crows is proverbial, and for this reason a family of kingbirds is a desirable adjunct to a poultry yard. On one occasion in the knowledge of the writer a hawk which attacked a brood of young turkeys was pounced upon and so severely buffeted by a pair of kingbirds whose nest was near by that the would-be robber was glad to escape without his prey. Song birds that nest near the kingbird are similarly protected.

The kingbird is largely insectivorous. It is a true flycatcher and takes on the wing a large part of its food. It does not, however, confine itself to this method of hunting, but picks up some insects from trees and weeds, and even descends to the ground in search of myriapods or thousand legs. The chief complaint against the species by both professional bee keepers and others has been that it preys largely upon honeybees. One bee raiser in Iowa, suspecting the kingbirds of feeding upon his bees, shot a number near his hives; but when the stomachs of the birds were examined by an expert entomologist, not a trace of honeybees could be found.

An examination of 665 stomachs collected in various parts of the country was made by the Biological Survey, but only 22 were found to contain remains of honeybees. In these 22 stomachs there were in all 61 honeybees, of which 51 were drones, 8 were certainly workers, and the remaining 2 were too badly broken to be further identified.

The insects that constitute the great bulk of the food of the bird are noxious species, largely beetles—May beetles, click beetles (the larvæ of which are known as wire worms), weevils, which prey upon fruit and grain, and a host of others. Wasps, wild bees, and ants are conspicuous elements of the food, far outnumbering the hive bees. During summer many grasshoppers and crickets, as well as leaf hoppers and other bugs, also are eaten. In the stomachs examined were a number of robber flies—insects which prey largely upon other

[1] *Sayornis sayus.* [2] *Tyrannus tyrannus.*

insects, especially honeybees, and which are known to commit in this way extensive depredations. It is thus evident that the kingbird by destroying these flies actually does good work for the apiarist. The 26 robber flies found in the stomachs may be considered more than an equivalent for the 8 worker honeybees already mentioned. A few caterpillars are eaten, mostly belonging to the group commonly known as cutworms, all the species of which are harmful.

About 11 per cent of the food consists of small native fruits, comprising some 30 common species of the roadsides and thickets, as dogwood berries, elderberries, and wild grapes. The kingbird is not reported as eating cultivated fruit to an injurious extent, and it is very doubtful if this is ever the case.

In the Western States the Arkansas kingbird [1] is not so domestic in its habits as its eastern relative, preferring to live among scattering oaks on lonely hillsides, rather than in orchards about ranch buildings. The work it does, however, in the destruction of noxious insects fully equals that of any member of its family. Like other flycatchers, it subsists mostly upon insects taken in midair, though it eats a number of grasshoppers, probably taken from the ground. The bulk of its food consists of beetles, bugs, wasps, and wild bees. Like its eastern representative, it has been accused of feeding to an injurious extent upon honeybees. In an examination of 62 stomachs of this species, great care was take to identify every insect or fragment that had any resemblance to a honeybee; as a result, 30 honeybees were identified, of which 29 were males or drones and 1 a worker. These were contained in four stomachs, and were the sole contents of three; in the fourth they constituted 99 per cent of the food. It is evident that the bee-eating habit is only occasional and accidental, rather than habitual; and it is also evident that if this ratio of drones to workers were maintained, the bird would be of more benefit than harm to the apiary.

FIG. 19.—Kingbird. Length, about 8½ inches.

The Cassin kingbird [2] has a more southerly range than the Arkansas fly-catcher. Examination of a number of stomachs shows that its food habits are similar to those of others of the group.

Three points seem to be clearly established in regard to the food of the kingbirds—(1) that about 90 per cent consists of insects, mostly injurious species; (2) that the alleged habit of preying upon honeybees is much less prevalent than has been supposed, and probably does not result in any great damage; and (3) that the vegetable food consists almost entirely of wild fruits which have no economic value.

All of the kingbirds are of the greatest importance to the farmer and fruit grower, as they destroy vast numbers of harmful insects, and do no appreciable damage to any product of cultivation.

NIGHTHAWK.

The nighthawk, or bull-bat [3] breeds throughout most of the United States and Canada, and winters in South America. It is strictly insectivorous, and hence does no damage to crops. The only charge that can be made against the bird is that it destroys some useful insects, but these are greatly in the minority in its food.

Nighthawks are so expert in flight that no insects can escape them. In their capacious mouths they sweep up everything from the largest moths and dragon flies to the tiniest ants and gnats, and in this way sometimes gather most remarkable collections of insects. Several stomachs have contained 50 or more different kinds, and the number of individuals ran into the thousands.

[1] *Tyrannus verticalis.* [2] *Tyrannus vociferans.* [3] *Chordeiles virginianus.*

Nearly a fourth of the birds' total food is composed of ants. These insects are generally annoying and often very injurious, especially on account of their damage to stored products and because of their habit of fostering destructive plant lice. More than a fifth of the nighthawk's food consists of June bugs, dung beetles, and other beetles of the leaf-chafer family. These are the adults of white grubs, noted pests, and even as adults many members of the family are decidedly harmful.

Numerous other injurious beetles, as click beetles, wood borers, and weevils, are relished. True bugs, moths, flies, grasshoppers, and crickets also are important elements of the food. Several species of mosquitoes, including the transmitter of malaria, are eaten. Other well-known pests consumed by the nighthawk are Colorado potato beetles, cucumber beetles, rice, clover-leaf, and cotton-boll weevils, bill bugs, bark beetles, squash bugs, and moths of the cotton worm.

Nighthawks are much less numerous than formerly, chiefly because of wanton shooting. They are given full legal protection almost everywhere, and citizens should see that the law is obeyed. The bird is far too useful and attractive to be persecuted.

THE WOODPECKERS.

Five or six species of woodpeckers are familiarly known throughout eastern United States, and in the West are replaced by others of similar habits. Several species remain in the Northern States through the entire year, while others are more or less migratory.

Farmers are prone to look upon woodpeckers with suspicion. When the birds are seen scrambling over fruit trees and pecking holes in the bark, it is concluded that they must be doing harm. Careful observers, however, have noticed that, excepting a single species, these birds rarely leave any conspicuous mark on a healthy tree, except when it is affected by wood-boring larvæ, which are accurately located, dislodged, and devoured by the woodpecker.

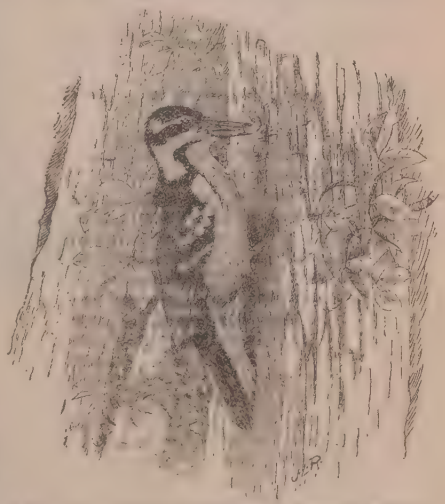

FIG. 20.—Hairy woodpecker. Length, about 9 inches.

Two of the best-known woodpeckers, the hairy woodpecker[1] (fig. 20) and the downy woodpecker,[2] including their races, range over the greater part of the United States. They differ chiefly in size, their colors being practically the same. The males, like those of many other woodpeckers, are distinguished by a scarlet patch on the head. An examination of many stomachs of these two species shows that from two-thirds to three-fourths of the food consists of insects, chiefly noxious kinds. Wood-boring beetles, both adults and larvæ are conspicuous, and with them are associated many caterpillars, mostly species that burrow into trees. Next in importance are the ants that live in decaying wood, all of which are sought by woodpeckers and eaten in great quantities. Many ants are particularly harmful to timber, for if they find a small spot of decay in the vacant burrow of a wood borer, they enlarge the hole, and, as their colony is always on the increase, continue to eat away the wood until the whole trunk is honeycombed. Moreover, they are not accessible to birds generally, and could pursue their career of destruction unmolested were it not that the woodpeckers, with beaks and tongues especially fitted for such work, dig out and devour them. It is thus evident that woodpeckers are great conservators of forests. To them more than to any other agency we owe the preservation of timber from hordes of destructive insects.

[1] *Dryobates villosus.* [2] *Dryobates pubescens.*

One of the larger woodpeckers familiar to everyone is the flicker, or golden-winged woodpecker[1] (fig. 21), which is generally distributed throughout the United States from the Atlantic coast to the Rocky Mountains. There it is replaced by the red-shafted flicker,[2] which extends westward to the Pacific. The two species are as nearly identical in food habits as their respective environments will allow. The flickers, while genuine woodpeckers, differ somewhat in habits from the rest of the family, and are frequently seen searching for food upon the ground. Like the downy and hairy woodpeckers, they feed upon wood-boring grubs and ants, but the number of ants eaten is much greater than that eaten by the other two species. Of the flickers' stomachs examined, three were completely filled with ants. Two of these contained more than 3,000 individuals each, while the third contained fully 5,000. These ants belong to species which live in the ground. It is these insects for which the flicker searches when it runs about in the grass, although some grasshoppers also are then taken. The flicker's habit of pecking holes in buildings sometimes greatly annoys his human friends, and it is particularly noticeable in the California species. Observation has shown that the object of the work is to obtain shelter for the winter. In the East most of the flickers are migratory, and only a few remain North where shelter is necessary. These generally find a safe retreat in the hollow tree in which they nested. In California, however, where the birds do not migrate, trees are not so abundant as in the East, and consequently buildings are brought into requisition, and in them holes are drilled, usually under the eaves, where snug nights' lodgings are found. Often a dozen holes may be seen in one building. Barns or other outbuildings are usually selected, though churches sometimes have been used.

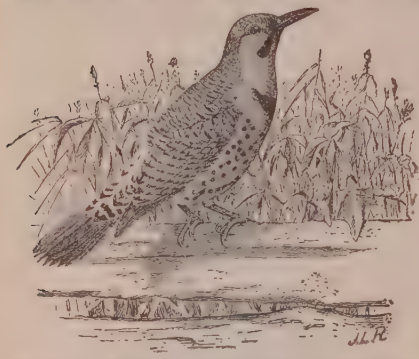

FIG. 21.—Flicker. Length, about 12½ inches.

The red-headed woodpecker[3] (fig. 22), is well known east of the Rocky Mountains, but is rather rare in New England. Unlike some of the other species, it prefers fence posts and telegraph poles to trees as a foraging ground. Its food therefore naturally differs from that of the preceding species, and consists largely of adult beetles and wasps which it frequently captures on the wing after the fashion of flycatchers. Grasshoppers also form an important part of the food. Among the beetles are a number of predacious ground species and some tiger beetles, which are useful insects. The red-head has been accused of robbing nests of other birds, and of pecking out the brains of young birds and poultry; but as the stomachs showed little evidence to substantiate this charge, the habit probably is exceptional.

FIG. 22.—Red-headed woodpecker. Length, about 9½ inches.

The vegetable food of woodpeckers is varied, but consists largely of small fruits and berries. The downy and hairy woodpeckers eat such fruits as dogwood and Virginia creeper and seeds of poison ivy, sumac, and a few other shrubs. The flicker also eats a great many small fruits and the seeds of a considerable number of shrubs and weeds. None of the three species is much

[1] *Colaptes auratus.* [2] *Colaptes cafer collaris.* [3] *Melanerpes erythrocephalus.*

given to eating cultivated fruits or crops. The red-head has been accused of eating the larger kinds of fruit, as apples, and also of taking considerable corn. Stomach examinations show that to some extent these charges are substantiated, but that the habit is not prevalent enough to cause much damage. The bird is fond of mast, especially beechnuts, and when these nuts are plentiful it remains north all winter.

Woodpeckers apparently are the only agents which can successfully cope with certain insect enemies of the forest, and, to some extent, with those of fruit trees also. For this reason, if for no other, they should be protected in every possible way.

THE CUCKOOS.

Two species of cuckoos are common in the United States east of the Great Plains, the yellow-billed cuckoo[1] (fig. 23) and the black-billed cuckoo,[2] and in the West a relative of the yellow-bill, the California cuckoo,[3] ranges from Colorado and Texas to the Pacific coast. While the two species are quite distinct, the food habits of the yellow-bill and the black-bill do not greatly differ and their economic status is practically the same.

Examination of 155 stomachs has shown that these species are much given to eating caterpillars, and, unlike most birds, do not reject those covered with hair. In fact, cuckoos eat so many hairy caterpillars that the hairs pierce the inner lining of the stomach and remain there, so that when the stomach is opened it appears to be lined with a thin coating of fur.

FIG. 23.—Yellow-billed cuckoo. Length, about 12 inches.

An examination of the stomachs of 46 black-billed cuckoos, taken during the summer months, showed the remains of 906 caterpillars, 44 beetles, 96 grasshoppers, 100 sawflies, 30 stinkbugs, and 15 spiders. In all probability more individuals than these were represented, but their remains were too badly broken for recognition. Most of the caterpillars were hairy, and many of them belong to a genus that lives in colonies and feeds on the leaves of trees, including the apple tree. One stomach was filled with larvæ of a caterpillar belonging to the same genus as the tent caterpillar, and possibly to that species. Other larvæ were those of large moths, for which the bird seems to have a special fondness. The beetles were for the most part click beetles and weevils, including a few May beetles. The sawflies were contained in two stomachs, one of which held no less than 60 in the larval stage.

Of the yellow-billed cuckoo, 109 stomachs (collected from May to October) were examined. They contained 1,865 caterpillars, 93 beetles, 242 grasshoppers, 37 sawflies, 69 bugs, 6 flies, and 86 spiders. As in the case of the black-billed cuckoo, most of the caterpillars belonged to hairy species and many of them were of large size. One stomach contained 250 American tent caterpillars; another 217 fall webworms. The beetles were distributed among several families, all more or less harmful to agriculture. In the same stomach which contained the tent caterpillars were 2 Colorado potato beetles; in another were 3 goldsmith beetles, and remains of several other large beetles. Besides the ordinary grasshoppers were several katydids and tree crickets. The sawflies were in the larval stage, in which they resemble caterpillars so closely that they are commonly called false caterpillars by entomologists. The bugs consisted of stinkbugs and cicadas, or dog-day harvest flies, with the single exception of one wheel bug, which was the only useful insect eaten.

[1] *Coccyzus americanus.* [2] *Coccyzus erythropthalmus.*
[3] *Coccyzus americanus occidentalis.*

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